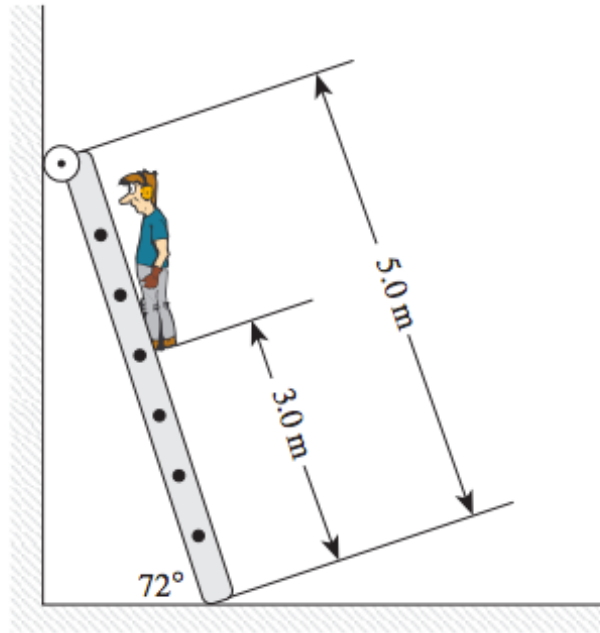


Quiz 5c

A 65 kg man is 3.0 m up a 5.0 m, 16 kg ladder leaning against a smooth wall at an angle of 72° as shown below. What minimum force of friction between the ladder and the floor is required to keep the ladder from sliding?



ANSWER:

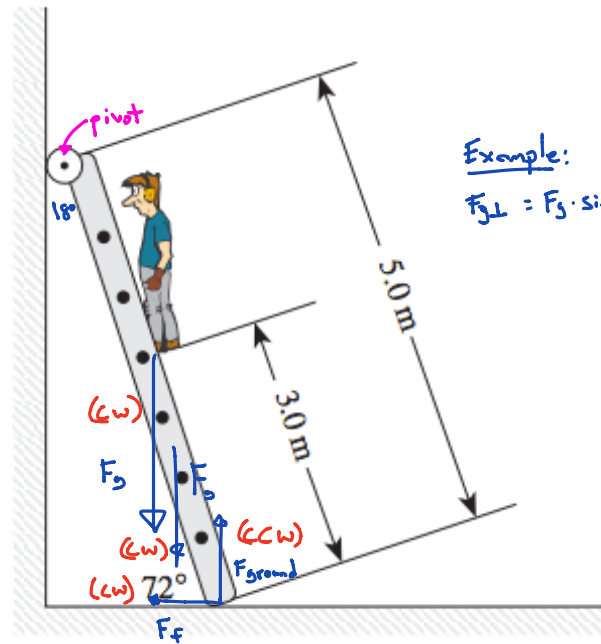
A 65 kg man is 3.0 m up a 5.0 m, 16 kg ladder leaning against a smooth wall at an angle of 72° as shown below. What minimum force of friction between the ladder and the floor is required to keep the ladder from sliding?

$$F_{g\text{man}} = 637 \text{ N}$$

$$F_{g\text{ladder}} = 156.8 \text{ N}$$

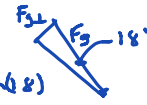
$$F_{g\text{ground}} = F_{\text{man}} + F_{\text{ladder}} = 793.8 \text{ N} \checkmark$$

$$F_{\text{up}} = F_{\text{down}}$$



Example:

$$F_{g\perp} = F_g \cdot \sin(18^\circ)$$



$$\sum \tau_{\text{cw}} = \sum \tau_{\text{ccw}} \checkmark$$

$$F_f d_1 \sin(18^\circ) + F_{\text{ladder}} d_1 \sin(18^\circ) + F_{\text{man}} d_2 \sin(18^\circ) = F_{\text{ladder}} d_1 \sin(18^\circ) \checkmark$$

$$F_f \cdot 5 \cdot \sin(18^\circ) + 156.8 \cdot 2.5 \cdot \sin(18^\circ) + 637 \cdot 3 \cdot \sin(18^\circ) = 793.8(5) \sin(18^\circ)$$

$$\boxed{F_f = 150 \text{ N}} \checkmark \checkmark$$

